BLUEPRINT FOR AN ENVIRONMENTALLY AND ECONOMICALLY SOUND CALFED WATER SUPPLY RELIABILITY PROGRAM

November 5, 1998

Save San Francisco Bay Association
Natural Resources Defense Council
The Bay Institute of San Francisco
Environmental Defense Fund
Natural Heritage Institute
Sierra Club
California Trout
Public Officials for Water and Environmental Reform
League of Women Voters of California
Center for Marine Conservation
Mono Lake Committee
Clean Water Action
California League of Conservation Voters
California Sportfishing Protection Alliance
Pacific Coast Federation of Fishermen's Associations
Friends of the River
Marin Conservation League
Sierra Nevada Alliance
Earth Island Institute

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INTRODUCTION AND SUMMARY

The mission of the CALFED Bay-Delta Program is to develop a comprehensive plan to restore the ecological health and improve management of water in the San Francisco Bay-Delta system for all beneficial uses. While CALFED has made substantial progress toward a program for restoring ecological health, it has struggled with developing a water supply reliability program and has confronted serious disagreements regarding the need for new surface storage facilities. The time has come to move forward with creative, viable solutions.

A viable CALFED solution must do more than restore the health of the Bay-Delta ecosystem. It must also improve the reliability of water supply for California's urban and agricultural economies. This blueprint articulates our assumptions and concerns, and outlines our recommendations for developing an affirmative program for improving water supply reliability.

We're committed to finding a CALFED solution that works for all of California.

Our Assumptions:

- **Defining "reliability."** What matters is the economic utility of water, not solely how much is delivered or diverted from the Delta. CALFED has confused quantity with water reliability. CALFED should adopt the following definition of water supply reliability:

  Improving the predictability and availability of economic benefits derived from water while restoring ecosystem health in the Bay-Delta estuary and watershed.

CALFED also should focus on providing water users with an economically and environmentally sound suite of dry year reliability strategies.

- **Let's be fair**. There are fundamental inequities in California water. Some water users pay a lot for the water they receive and others pay little or nothing. Some are contributing to Bay-Delta restoration, while others are not. Some meter their water use and prepare and implement conservation plans. Others do not. Some have very reliable water supplies. Others do not. While CALFED did not create these problems, it must address them.

- **Ecosystem restoration improves water supply reliability.** Restoration of the Bay-Delta ecosystem is the foundation of all efforts to improve water supply reliability. As long as species and habitats continue to decline and be degraded, we will continue to contend with regulatory uncertainty.

- **There is no "new" water.** There is a finite amount of water in the system. What some have called, "new" water is, in fact, further reallocation of water from the environment. The ecosystem has been depleted to the point where its resources are crashing. We can use our current supplies better, rather than trying to build our way out of our problems.

- **First, do no harm.** Any water supply reliability activities undertaken pursuant to a final CALFED decision should support full ecosystem recovery and should not cause further ecosystem degradation.

- **Price matters.** No one, especially the taxpayer, wants to pay more than needed to solve these problems. In addition, moving aggressively towards pricing that reflects the economic and environmental value of water will encourage efficient water use.

Our Concerns

- **Baseline, Baseline, Baseline.** CALFED has not provided a clear and accurate picture of historic and current water supply, demand or use by any sector. Defining an accurate and comprehensive "baseline" is a critical issue not only for purposes of clear accounting, but because inaccurate claims and beliefs are driving policy decisions.

- **Dams or No Dams? Wrong Question.** Unfortunately, the past year has been characterized by a divisive preoccupation with arguments for and against the construction of new surface storage. The issue of surface storage has somehow become divorced from the key questions CALFED was created to answer: how best to restore the ecosystem and reliability of water supply and water quality. CALFED should begin its stage 1 program by implementing environmentally and economically sound water supply reliability tools, such as groundwater storage, transfers, conservation and reclamation, to produce near-term benefits and inform long-term decisions about water supply. Although we do not support CALFED's current presumption regarding the need for new surface storage, we believe that surface storage should continue to be evaluated in light of the potential benefits of the water supply reliability tools described in this document.

- **"Let's Get Better Together" Has Become Code For "If I Don't Get Better, Neither Should You."** This 'quid pro quo' philosophy ignores the fact that the interests do not come to the table as equal players – the ecosystem is on the verge of collapse, while the agricultural and economic sectors have continued to thrive.

- **More of the Same is Not the Answer.** The ecosystem has borne the brunt of conventional water development for more than a century. There is no better reason for looking for a new approach.

Our Water Supply Reliability Program

This blueprint discusses a variety of water supply reliability tools. The table below summarizes a preliminary range of yield and storage which could be produced by these tools and which should be shared between the environment and consumptive water users.

Table 1: Preliminary Summary of Potential Water Supply Reliability Strategies*

	Strategy	**Potential Yield (acre-feet)**
Demand side	Irrigation efficiency	340,000-1,700,000
	Voluntary fallowing (dry year, rotational, permanent, etc.)	420,000-2,100,000
	Water acquisitions and transfers	Composite of irrigation efficiency, fallowing, groundwater and others.
	Full implementation of urban BMPs	1,500,000
	Improved landscaping requirements	520,000 -1,400,000
	More efficient washing machines	97,000-194,000
	Commercial ultra low flow toilets	200,000
	Existing residential indoor BMPs above MOU-specified levels	300,000
	Existing commercial, industrial and institutional BMPs above MOU-specified levels	350,000-650,000
	Reclamation and recycling	1,170,000-1,720,000
Supply side	Groundwater banking and management	900,000-1,000,000
	Delta reoperation	122,000-137,000
	Upper watershed restoration	No estimate available yet.
	Flood reservations	400,000-600,000 (Storage)

* As discussed above, CALFED's water supply reliability program must provide water to support Bay-Delta ecosystem recovery. This will require substantial amounts of water. Improving Delta flow conditions in Stage 1 may require 123,000-372,000 acre-feet. Further improvements for upstream areas and Suisun Marsh will require additional water.

These preliminary figures are not additive. However, these tools offer the potential to go far beyond what CALFED has considered to date and could generate millions of acre feet of water for all users. They can form the basis for an environmentally and economically sound water supply reliability program. Section 3 discusses each of these strategies in greater detail.

This blueprint is focused primarily on tools to generate water supply reliability benefits. Further work needs to be done on programs to address water quality and other program objectives. However, it is clear that by developing a water reliability strategy by using above water supply tools, CALFED can help meet its other program goals. An approach which truly produces multiple beneficiaries is most likely to prove cost-effective.

Our Preliminary Recommendations

We applaud CALFED's effort to begin identifying specific actions for Stage 1. However, the measures proposed in CALFED's draft preferred alternative document reflect a bias in favor of new surface storage and a tepid effort on alternative approaches. In contrast, we propose a set of Stage 1 actions in Section 4 that emphasizes:

- Maximizing conservation and recycling potential;
- Jumpstarting groundwater management and appropriate storage;
- Facilitating appropriate water transfers;
- Ensuring environmental water reliability;
- Improving the operation of existing dams and canals;
- Developing a comprehensive water supply/demand baseline ;
- Developing realistic modeling assumptions; and
- Pricing water to reflect its true economic and environmental value.

Our Commitment

Our organizations are committed to fixing the environmental and water management problems in the Bay-Delta Estuary. We believe that CALFED's original approach – to address these problems in a broadly-supported, comprehensive package – is correct. We invite all stakeholders and public officials to join us in a productive dialogue to craft a solution that brings Californians together.

SECTION I: OBJECTIVES FOR WATER SUPPLY RELIABILITY

A. CALFED Has Failed to Adequately Define Water Supply Reliability

CALFED currently defines its water supply reliability objective as:

> Reduce the mismatch between Bay-Delta water supplies and current and projected beneficial uses dependent on the Bay-Delta system. This strategy seeks to: reduce the mismatch between supply and beneficial uses through a variety of actions; reduce the impacts of water diversion on the Bay-Delta system; and increase the flexibility to store and transport water. (Phase II interim report)

This objective is impossible to measure, in sharp contrast with the intense efforts to quantify the goals of the ecosystem restoration program and to develop measurable targets. In addition, the current CALFED approach to water supply reliability fails to:

- **Recognize that the price of water has an effect on both the demand for water and the supply of water.** As the cost of developing additional water supplies increases, demand for water will decrease and other sources of water (e.g. transfers and conservation) will become even more competitive. CALFED has not adequately integrated core economic principles and analysis into its water supply reliability planning.

- **Establish a level playing field between strategies focused on supply and demand.** If increased storage is itself an objective, then demand side strategies, no matter how successful, are doomed to be inadequate. CALFED has assumed a very limited approach to demand-side management, overstated future demand (see Section II), and then concluded that new reservoirs are "necessary" to meet the reliability goal. Indeed, CALFED has gone so far as to identify increased storage as a specific program objective, rather than identifying storage as a means (on a par with conservation and other options) for attaining the reliability goal, thus creating an inherent bias.

- **Integrate the role of the environment in determining water supply reliability.** Healthy aquatic ecosystems require water supplies of adequate quantity, quality and timing. CALFED's definition of reliability fails to reflect these needs. Nor does it reflect the increased water supply reliability that would accrue to water users once the ecosystem has achieved a level of health and sustainability. By ignoring environmental requirements, and the reliability implications of environmental degradation, CALFED's reliability objective biases the program in favor of strategies which are the least compatible with ecosystem health.

B. CALFED Should Redefine Its Water Supply Reliability Goals

CALFED's water supply reliability program must contribute to the long term health of the urban, agricultural and fishing industries which depend on the Bay-Delta, as well as the environment. It is our view that **water supply reliability is more accurately defined as improving the predictability and availability of economic benefits derived from water, while restoring ecosystem health in the Bay-Delta estuary and watershed.** We propose to shift CALFED's reliability objective from its limited focus on increasing absolute amounts of water available for consumptive use to increasing the predictability of benefits. More water is only one of many ways to achieve such predictability. In fact, during the 1987-1992 drought, maximizing water deliveries resulted in drained reservoirs, devastated fisheries and decreased predictability. .Our definition of water supply reliability includes three major component objectives:

1. Improve the long term economic benefits of water supply to sectors of the California economy dependent on Bay-Delta water supplies.

CALFED should recognize the ability of individual water users to utilize both supply- and demand-side strategies. Supply alone fails to provide predictability of benefits and fails as an adequate measure of reliability. For example, growers can adapt to lower dry year contract supplies through conservation and water transfers. By providing a range of viable water reliability strategies, CALFED could help maintain the long-term profitability of a given grower, even if dry year contract deliveries remain unchanged. The bottom line for agricultural, municipal and industrial users is not unit of water delivered, but rather the benefits derived. [1]

Measuring economic benefits by sector will provide a valuable indication of the true value of water supplies. Such an approach will also adjust for regional variances. Finally, we recognize that tying the water supply reliability objective to economic benefits is complex, since a variety of factors affect economic well being (e.g. interest rates and market conditions). However, this is no different than CALFED's proposals for measuring ecosystem health, which is similarly dependent upon factors outside the control of the CALFED program.

2. Improve predictability of water availability to individual water users and districts in dry years.

A program focus on assuring long term economic productivity will go a long way toward ensuring the adequacy of water reliability. However, we recognize that it may not be fully adequate to address water needs during particularly dry years. Under the current water management regime, the next drought is likely to result in further ecosystem

[1] We believe that this economically-oriented objective incorporates the provision of adequate supplies for basic indoor domestic water use. Moreover, adequate drinking water supplies are not a limiting factor in achieving water supply reliability.

degradation and unpredictability for consumptive water users. CALFED should attempt to increase the predictability of water availability during dry years. Volume of contract deliveries alone is inadequate to measure dry year predictability.

The limits of using contract deliveries as a measure of success is amply demonstrated by the continued productivity of Central Valley agriculture during the 1987-1992 drought, despite reductions in contract deliveries. CALFED should adopt an objective that focuses on water availability to individual water users and districts, rather than the current focus on water contract deliveries to regions. Such dry year strategies could include dry year supplies from conjunctive use programs, water transfers, voluntary fallowing, conservation, purchased storage in existing surface reservoirs and more, in addition to contract deliveries. Strategies to increase the predictability of dry year supplies should not be designed to prevent any change in water use during dry years. Rather, they should be designed to reduce dry year impacts and provide options for water users. In the context of these options, we expect that some individual water users and districts will choose to enter dry year water markets as sellers and others as purchasers. Encouraging well-informed decisions by water users among a variety of options is perhaps CALFED's best strategy to promote efficient water use and reduce impacts during times of shortage.

In practical terms, there is a major difference between solutions that improve dry year benefits and those that improve average year benefits. For instance, water transfers designed to increase reliability in dry years (e.g. dry year options) can help keep agricultural land in production. These same market strategies can be used to increase long term supplies, through voluntary agricultural land retirement. Whatever the merits of retiring a given piece of agricultural land, tools targeted at average supplies and dry year reliability have very different effects.

As discussed in section 3, many strategies could provide increased predictability in dry years. As CALFED further develops these strategies, it should develop an approach that provides adequate evaluation and measurement of the access which individual water users and districts have to strategies to improve reliability during dry years.

3. Assure that the water supply reliability program actively promotes CALFED's ecosystem restoration goals.

It is essential that CALFED recognize the water supply reliability benefits of achieving its ecosystem restoration objectives. The recovery of endangered species, for example, would dramatically increase the predictability of water supplies. In addition, CALFED's water supply reliability program must support -- rather than compete with -- the flow improvements necessary to achieve the ecosystem restoration objectives. In short, CALFED's water supply reliability program must do more than simply reduce environmental impacts (as stated in the current CALFED definition). It must be fully integrated with the ecosystem restoration program. Such an approach will better serve both the environment and water users.

This has significant ramifications for the water supply reliability objective. For example, increasing operational flexibility for consumptive uses without also using that flexibility to meet the objectives of the ecosystem restoration program is likely to result in further environmental degradation, thereby reducing reliability. CALFED's water supply reliability program must provide reliability for the environment, not merely for water users. It is now widely accepted that the attainment of water supply reliability and ecosystem restoration are inextricably linked; this linkage must be formally recognized in the objectives that guide CALFED.

CALFED can evaluate progress towards this reliability objective by measuring specific contributions to the attainment of objectives for endangered species recovery, desired annual hydrograph, in-stream flow improvements, and other components of the CALFED ecosystem restoration program. Attainment of these objectives will result in increased reliability for all water users.

It is important to note, however, that unpredictability of water supplies which results from slow progress in attaining ecosystem restoration goals should not be used as a rationale for reducing ecosystem restoration funding, or for constructing new surface storage facilities which could result in further ecosystem damage.

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SECTION II: WATER SUPPLY IN CONTEXT

CALFED's water supply reliability program is being driven in part by flawed notions about what current and future demand for consumptive use of water is and will be, and concern that environmental protections have had substantial impacts on agricultural and urban water users. Indeed, CALFED appears to be taking seriously claims that these relatively modest protections have caused actual water shortages. The purpose of this section is to provide historic context for current and projected water demand, and to provide an alternative perspective of the "water costs" associated with environmental protections by using actual Delta export data.

A. Historical Overview

In California's Central Valley watershed, developed water use has steadily increased over the last 150 years and has substantially reduced instream flows. In the San Francisco Bay/Delta the impacts of this development have been exacerbated by the export of much of the remaining freshwater inflow to the San Joaquin Valley, the Tulare basin and the Los Angeles basin. As these exports have increased over the last 30 years, the fishery populations have plummeted. Many aquatic species now qualify for Endangered Species Act (ESA) protections. Figure 1 summarizes the concurrent decline of fish populations along with increased Delta exports from 1967-1996.[2]

Over the 20-year period from 1975-1994, water users south of the Delta exported about 4.6 million acre-feet (AF) on average. However, exports steadily increased over this time frame reaching a record high of 6.1 million AF in 1989, notwithstanding a series of very dry years in the late 1980s and early 1990s. Indeed, total Delta outflow was less than 35 percent of estimated unimpaired flows for four straight years 1988-1991.[3]

State and federal governments began to consider and implement environmental protections under the CVPIA, the federal and state clean water acts and endangered species statues in the early 1990s. Various studies have been generated purporting to demonstrate that these limited environmental protections have had, and will have in the future, enormous water supply impacts. Recent claims have been over 2 million acre feet per year.

However, it is essential that the CALFED solution be based on clear and accurate information. Close analysis reveals that the water supply impacts of environmental protection are relatively modest -- certainly no more than the water users felt was reasonable when they signed the Bay-Delta Accord four years ago. We base this conclusion on the tables 2 and 3 of this section. These tables analyze the impact on Delta

[2] DWR's DAYFLOW database is the source of all Delta export and outflow values in this Appendix. CDFG's data for fish passage at Red Bluff are used for population values for salmonids and steelhead. Midwater trawl data is used for population values for Delta smelt, longfin smelt and striped bass.
[3] Unimpaired flow data provided by DWR.

exports of environmental protections against two different baselines; actual exports and a modeled projection of exports assuming a 1995 level of demand and the D-1485 standards.

The water supply "impacts" of environmental protections are correctly characterized as "the loss of historic supplies to consumptive users." Thus, the best way to define the baseline for determining such impacts is actual historic export levels.[4] Comparing projected operations under environmental protections with exports that have actually taken place provides the most realistic assessment of potential impacts. Nevertheless, we have included here analyses of water supply impacts associated with environmental protections using both historic (actual) data and DWR's projected future definition of baseline. We have compared these two baselines with the same regulatory regime -- the current environmental protections afforded by the CVPIA, the 1995 Water Quality Control Plan and ESA criteria. Results of this comparison are illustrated in tables 2 and 3.

Table 2
Delta Export Comparison
Baseline: Actual Exports
(all values in TAF)

	Baseline: Actual Exports	Current Regulatory Conditions: Projected Exports under ESA, WQCP, CVPIA (DWRSIM Study 549new)	
Period	Average	Average	Difference from Actual
October 1975 - September 1994	4596	5297	701
June 1986 - September 1992	4979	4328	-651

Table 3
Delta Export Comparison
Baseline: DWRSIM D1485 Study
(all values in TAF)

	Baseline: Projected Exports Under D1485 (DWRSIM Study 693)	Current Regulatory Conditions: Projected Exports under ESA, WQCP, CVPIA (DWRSIM Study 549new)	
Period	Average	Average	Difference from Actual
October 1975 - September 1994	5843	5297	-547
June 1986 - September 1992	5257	4328	-929

[4] South of Delta deliveries are sometimes used to estimate impacts in place of Delta exports.

Table 2 looks at projected levels of export under the current environmental protections compared with actual historic exports. Historic annual exports from the Delta were about 4.6 million AF on average (1975-1994). The current relatively limited environmental protections have not resulted in major adverse impacts on historic levels of export. On the contrary, with current environmental protections in place, under a repeat of the 1975-1994 conditions, Delta exports would be about 5.3 million AF -- or about 700,000 AF <u>more</u> per year than the water users actually exported on average.

Nor is it the case that current environmental protections would result in unreasonable impacts during prolonged drought periods. Table 2 demonstrates that during the most recent prolonged drought period (June 1986-September 1992), actual Delta exports were about 4.97 million AF. During a repeat of these conditions, with the current environmental protections in place, south of Delta exports would be about 4.3 million, or a decrease in annual average exports of about 650 TAF. While this is not an insignificant amount, it is well below estimates of the water costs associated with environmental protections. Even more significantly, it is well below what the water users themselves determined was "reasonable" when they signed the Bay-Delta Accord four years ago.

Table 3 looks at these water costs using a different baseline -- an entirely hypothetical modeling projection that does not reflect exports ever provided to south of Delta exporters. As discussed above, DWR has assessed the "impact" of environmental protections using a baseline that assumes a 1995 level of demand and the D-1485 standards. (We emphasize that we are aware of no justification or support for the notion that this level of demand somehow represents an absolute entitlement such that any level of export below this level counts as an "impact".) Nevertheless, even under this questionable baseline, projected water costs of current environmental protections is far below many water user claims. On average, DWR's study demonstrates that under its hypothetical baseline Delta exports would be about 5.8 MAF annually. With environmental protections in place, projected exports would decrease by about 547 TAF -- or less than 10%. In a repeat of a lengthy drought, exports could decrease from 5.2 MAF to 4.3 MAF, or about 929 TAF.

We do not discount the significance of this drought period estimate. However, this worst case scenario is again well below the highly inflated claims that are routinely employed in the CALFED process to justify immediate construction of new dams and surface reservoirs -- and again below the level of impact the water users agreed to in signing the Bay-Delta Accord. It is worth noting that the environmental criteria reflected in these DWR studies include a broader ranger of protections than those used for purposes of the Bay-Delta Accord "impact" modeling. Thus, it now appears that the combined water supply impact of the ESA, CVPIA and Water Quality Control Plan protections is somewhat **less** than the anticipated water costs of the Bay-Delta Accord alone. If nothing else, this fact indicates that CALFED must use great caution in premising its water supply reliability program on modeled projections and any such studies must receive careful and comprehensive review.

Additionally, it is critical to acknowledge that the limited water supply impacts of current (critically needed) environmental protections have not resulted in water shortages. When subsidized water has been less than fully available, the water users have been able to avail themselves of water on the open market. For example, during the drought of the late 1980's and early 1990's, Westlands Water District secured additional water supplies through many of the water supply reliability tools analyzed in Section 3, including water transfers and improved water conservation practices. Over the five year period from 1990 to 1994, despite reductions in the amount of federally subsidized water it received, Westlands was able to adapt and maintain very productive crop yields and gross crop values. Given the existence of adequate tools that we propose, water users will have substantially improved access to water.

In other words, even in dry years, the water users have not lost water supply -- they have simply experienced reductions in water subsidies. As discussed further in section 2, this is appropriate public policy because it will encourage more efficient use of water. A healthy and appropriate water transfer market, as well as the other tools discussed in Section 3 will mean that what the water users may lose in subsidies they will more than make up in increased reliability.

Finally, not every reduction in water supply, or the availability of subsidized water, can be laid at the door of environmental protection. Under California's appropriative rights system, in some years drier weather alone will trigger shortages for those districts that have the most junior status, even though other more senior water users will receive full contract supplies.

B. <u>Overestimating Current and Future Demand</u>

The assumptions used by CALFED to estimate urban water demand are based on questionable projections from DWR's Bulletin 160-98 which dramatically overestimate current and projected demands for consumptive use, and underestimate savings from current and projected water conservation strategies. Among the program's faulty assumptions:

- Current water demand is overstated by up to 1.2 million acre-feet. Demand projections for 2020 are based on this inaccurate baseline.

- Errors in forecasting methodology underestimate water availability by hundreds of thousands of acre-feet.

- 2020 urban demand is overstated by an additional one million acre feet because of the failure to include all applied water reductions as reductions in future demand.

In light of these problems, CALFED should also reevaluate its assumptions regarding agricultural water demand before proceeding with further analysis. In all cases, demand responsiveness to price, must be fully integrated into the supply/demand assessment, upon which CALFED's assessments are based.

Figure 1(a)
Historic Delta Exports and Fish Populations
(population data available only since 1967)

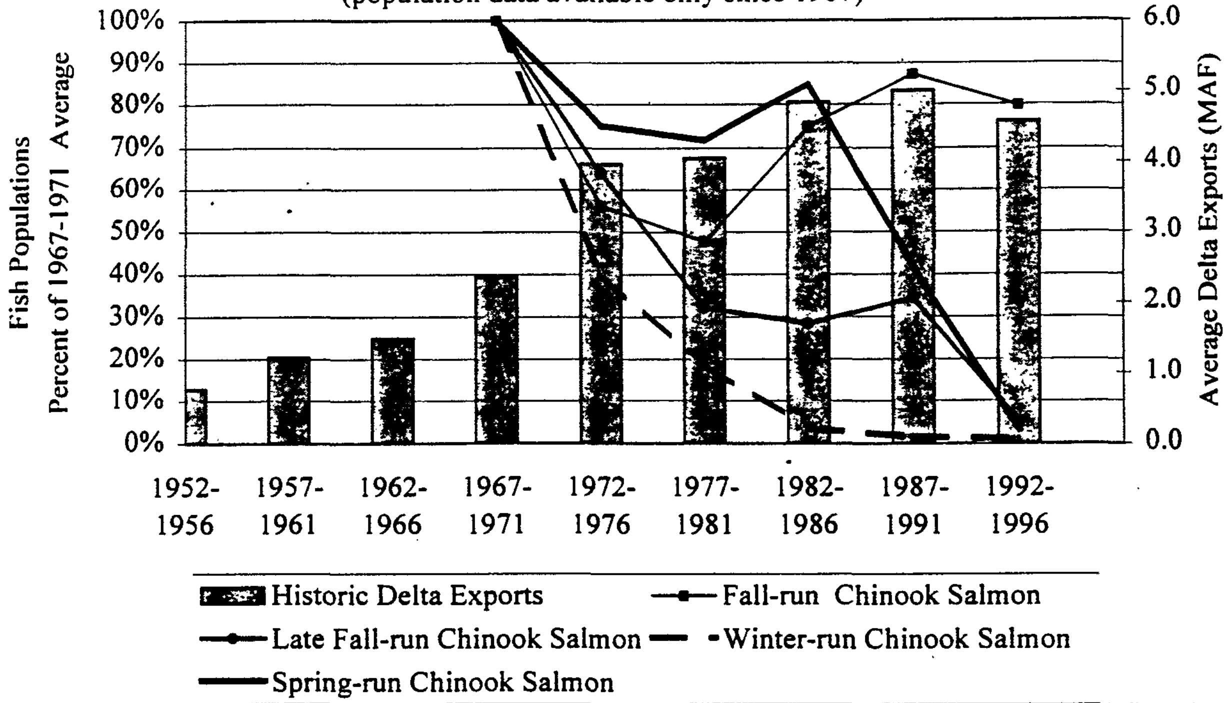
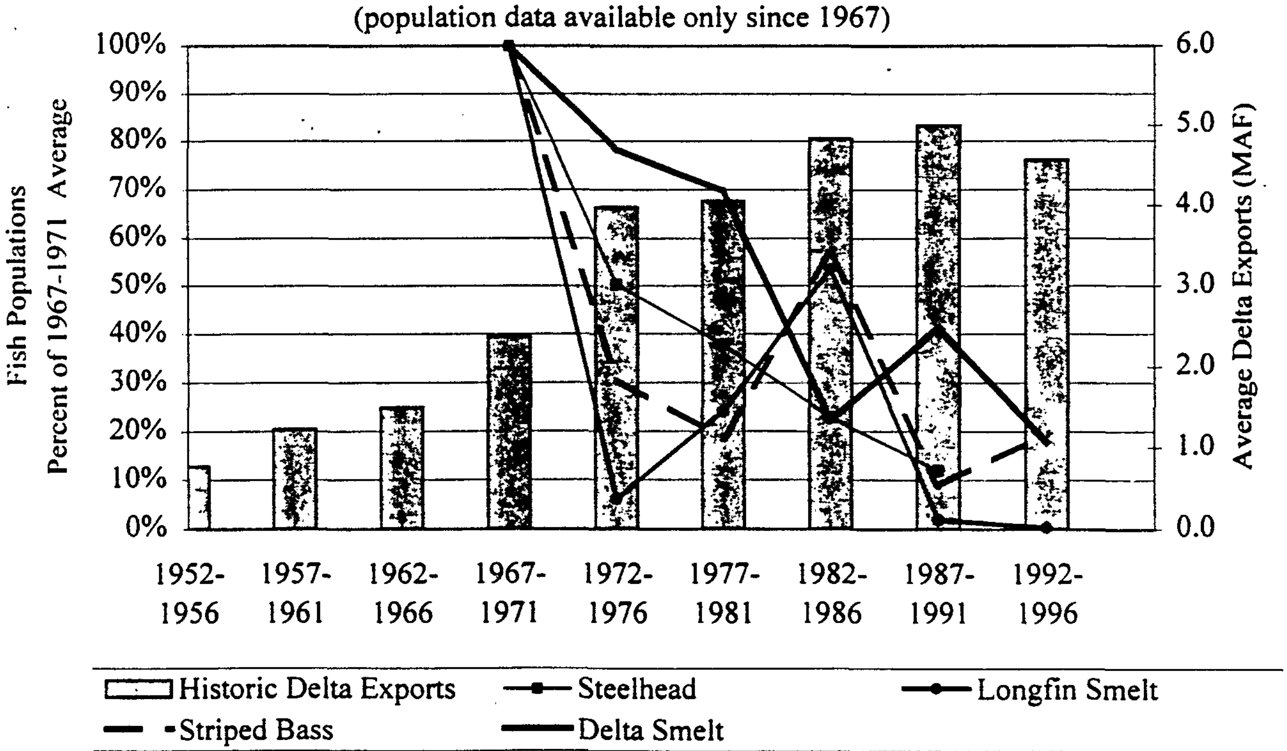


Figure 1(b)
Historic Delta Exports and Fish Populations
(population data available only since 1967)



SECTION III: ACHIEVING WATER SUPPLY RELIABILITY WITHOUT NEW DAMS

CALFED has not adequately analyzed the potential for alternatives to new dams and surface reservoirs to provide water supply reliability. This section initiates a fuller discussion of these options. The analysis below is preliminary and is based on the limited data available to our organizations. The figures provided are a rough approximation of the water supply that could be saved or made available through "soft path" means and other approaches compatible with ecosystem restoration.

This analysis is not a definitive or exhaustive discussion, but should provide the CALFED Policy Group and staff with a starting point. Clearly a thorough investigation of the issues raised in this section must be conducted before CALFED commits itself any further to a "presumption" that new surface reservoirs are required to attain the water supply reliability objective. We have not, for example, performed an economic analysis of these alternatives. We continue to urge CALFED to complete such an analysis before making decisions regarding the need for new storage and conveyance projects. We believe that the results of this analysis will demonstrate that the strategies outlined below provide the basis for an environmentally and economically sound water supply reliability program. We further believe relying on the diverse mix of water management tools discussed below will reduce system vulnerability, as well as reduce the risk that CALFED will create stranded assets by constructing expensive facilities to which cheaper alternatives exist.

In the future, we will present our recommendations for the CALFED water quality and system vulnerability programs. The measures discussed below will comprise one part of our water quality recommendations, as we believe that implementation of these measures, such as improved agricultural irrigation efficiency, voluntary land retirement, watershed restoration and water reclamation, can offer substantial water quality benefits. In addition, as we have previously recommended, implementation of measures to address Delta subsidence can reduce system vulnerability and improve water supply reliability.

The discussion below is divided into four subsections. First, we discuss the need for a foundation of baseline information and appropriate financing tools for a water supply reliability program. Second, we discuss demand strategies to better utilize existing developed water supplies. Third, we address "supply side" strategies which could be conditioned to provide water supply benefits for urban and agricultural water users, as well as the environment. Fourth, we discuss some of the flow-related ecosystem requirements which the water supply reliability program must address. We believe that implementation of the CALFED water supply reliability program, particularly the "supply side" strategies discussed below, must be formally linked with assurances that ecosystem flow and other requirements will be provided. Specifically, the environment should benefit directly from the implementation of each water supply reliability tool discussed below. We propose the following package of potential strategies:

A. <u>A Water Supply Reliability Foundation</u>

A solid foundation of reliable information and financing is a key to the ultimate success of the CALFED water supply reliability program.

1. Developing a Baseline and a Water Budget

CALFED should develop and implement a comprehensive budget for use of the Bay-Delta's waters. Exports and diversions from the system have increased over time, and, the total amount of withdrawals and depletions has not been adequately measured. Such a budget would provide the comprehensive information needed to make well-informed decisions. It could also promote ecosystem restoration and sustainable economic use. Such a budget will require an accurate and comprehensive water use measurement and reporting program.

2. Modeling Assumptions

The modeling for CALFED's "no action" alternative assumes that the CVP and the SWP will make full deliveries of contracted supplies in the future. As discussed above, such deliveries would be inconsistent with existing law (e.g. ESA, CWA, CVPIA), CALFED's ecosystem restoration goals and "no redirected impacts" principle. By building these increased deliveries into the "no action" alternative, the modeling masks the potential environmental impacts of CALFED's water supply reliability alternatives. Correcting this assumption is essential for CALFED to weigh accurately the benefits and impacts of a final CALFED package. In addition, correcting this assumption is essential to comply with CALFED's commitment not to balance the state water budget on the back of the Delta.

3. Financing and Pricing

Past water pricing policies have consistently understated the "true cost" of water development through financial subsidies and by failing to assign economic cost to ecosystem destruction. These policies have combined to inflate expectations, create a perception of shortages and encourage environmentally damaging water development.

To avoid such problems in the future, CALFED should adopt a comprehensive pricing strategy that ensures that all water supply alternatives incorporate in full their associated economic and environmental costs. In particular, direct beneficiaries should pay the full planning and construction cost of any new storage or conveyance facilities.

In addition, CALFED's financing package must address the unmet mitigation obligations of water users. This should include, for example, a set of surcharges on water use and development in the Bay-Delta system to assist in ecosystem restoration and the dedication of a share of any new water supply facilities to ecosystem restoration.

B. Demand-Related Strategies

1. Agricultural Water Conservation

Improve irrigation efficiency. Agriculture uses over 80% of the developed water supply in California. Relatively small changes in agricultural demand can yield tremendous quantities of water. For example, a small reduction in the percentage of applied water lost to evaporation by switching to more efficient technology, or by improved irrigation scheduling, can yield significant water savings.

Evaporative losses are irretrievable and a non-productive use of water. Flood irrigation is estimated to lose 20 to 30 percent to evaporation from open water surfaces and transpiration by weeds.[5] Evaporation losses from sprinkler systems, which are currently used on approximately 35 percent of the irrigated acreage in California,[6] are estimated to be as high as 9 percent, while micro-irrigation systems are estimated to have minimal evaporative losses.[7] Overall, a one to five percent reduction in agricultural demand due to reduction in evaporative losses or other changes in water use could generate 340,000 - 1,700,000 acre-feet.[8] These changes in irrigation practices could also have a substantial positive impact on water quality by reducing surface runoff and subsurface drainage.[9]

Increase use of market-based incentives. A voluntary program of compensated dry year fallowing of agricultural lands (dry year options) could generate a substantial dry year water supply. For example, dry year fallowing of 5 to 15 percent of the land currently used to grow alfalfa, pasture forage and cotton in the Central Valley and Colorado River regions could potentially generate 400,000 to 1.2 million acre-feet in those years.[10] These reductions are based on evapotranspiration rates and constitute reduction in consumptive use. Reductions in the volume of applied water are even greater, yielding additional environmental benefits. The CVPIA Least Cost Yield study reached similar conclusions, finding that 1.24 million acre feet of non-CVP consumptive use could become available through voluntary land fallowing "capped" at 20 percent of existing use in the Central Valley. Estimated costs range from \$55 to \$255 per acre foot.[11] The same report found that 300,000 acre-feet could be made available within the CVP service area. Applying

[5] Peter Gleick et al, *Review of the CALFED Water Use Efficiency Program Technical Appendix* (Pacific Institute for Studies in Development, Environment and Security, Oakland: 1998) p. 20.
[6] David Sunding, et al., "The Costs of Reallocating Water From Agriculture,: University of California, Berkeley, 1994.
[7] Greg Young and Steve Hatchett, "On-Farm Irrigation System Management," Technical Memorandum, June 6, 1994, p. 3-2.
[8] Based on 1995 average year agricultural water use, as reported in Bulletin 160-98, p. 1-20.
[9] Ronnie Cohen and Jennifer Curtis, *Agricultural Solutions: Improving Water Quality in California Through Water Conservation and Pesticide Reduction* (NRDC, San Francisco: 1998).
[10] This estimate was derived based on crop acreage by region from Bulletin 160-98, and average crop ET by region from Bulletin 160-93. The actual yield of dry year options must be adjusted to consider irrigation prior to the exercise of an option and potential dry year supply shortages.
[11] CVPIA Least Cost Yield Program, 1995.

the same methodology to the consumptively used portion of the Imperial Irrigation District's water supply would produce another 600,000 acre feet, for a total of up to 2,140,000 acre-feet. A reasonable minimum estimate of dry year fallowing can be obtained from the 1991 drought water bank. In that year, 420,000 acre-feet of "no irrigation" contracts (exclusive of "groundwater exchange and multiple response") were signed by DWR.[12]

Voluntary, compensated retirement of marginal quality lands on the west side of the San Joaquin Valley will have multiple benefits that could help meet the CALFED objectives in many areas, including water quality, water supply reliability, and ecosystem restoration. CALFED's preliminary analysis showed that a voluntary program of compensated land retirement could generate as much as 1.5 million acre-feet of water at an average cost of $150 per acre foot. This cost is significantly less than the projected costs of many other water supply augmentation options currently under consideration.

The 1990 joint federal-state "Rainbow Report" forecast that, by 2040, 460,000 acres of San Joaquin Valley lands would be significantly drainage impaired.[13] It recommended a suite of actions, including land retirement, in its drainage management plan. Even assuming the full accomplishment of the other measures, such as conservation and reduction of deep percolation, the Rainbow Report recommended that 75,000 acres be retired from willing sellers. Assuming an average allocation of 2.5 acre-feet per acre, and assuming that .5 acre-feet per acre is necessary for subsequent land management activities, retiring this amount of land from willing sellers could generate 150,000 acre-feet of water. Voluntary retirement of 75,000 acres is projected to occur pursuant to the CVPIA, even in the absence of a CALFED solution. Voluntary land retirement above this amount can further contribute to the CALFED solution.

These figures are preliminary only, and provided here for illustrative purposes. The degree to which market-based voluntary dry year fallowing and voluntary land retirement should be implemented, and under what conditions, deserves far more exhaustive analysis than CALFED has undertaken to date. CALFED must conduct a serious examination of these options.

2. Urban Water Conservation

The urban element of the CALFED water use efficiency program is based largely on full implementation of the Memorandum of Understanding Regarding Urban Water Conservation (MOU) – which is expected to generate 1.5 million acre feet of demand reduction by 2020.[14] While the CALFED documents recognize that implementation of

[12] "California's 1991 Drought Water Bank: Economic Impacts in Selling Regions," (Rand, 1993).
[13] San Joaquin Valley Drainage Program, 1990. *Management Plan for Agricultural Subsurface Drainage and Related Problems on the Westside San Joaquin Valley*, U.S. Department of Interior and California Resources Agency, Sacramento, California.
[14] Department of Water Resources, Bulletin 160-98: The California Water Plan Update, (Sacramento: 1998) p.4-16.

the MOU should comprise the "floor" or base level of conservation, rather than a ceiling, the CALFED program makes little effort to quantify, let alone pursue, the substantial conservation savings that exist above the level to be obtained by full implementation of the MOU. Some of the available savings are described below.

<u>Promote low water use landscaping and more efficient irrigation</u>. Landscaping represents 30 to 60 percent of urban water use water use.[15] According to CALFED, urban water use amounts to 8.7 million acre-feet. Total water use for landscape purposes therefore ranges from 2.6 to 5.2 million acre feet. Landscape water audits, timers, and xeriscape could reduce landscape water use by approximately 10 to 15 percent. Greywater systems or rain cisterns can conserve much or all of landscape water use in individual applications. Statewide, a 20% reduction in landscape water use would yield 520,000-1,400,000 acre-feet.[16] Because the Urban MOU targets a limited number of customers for landscape water audits, even full implementation of the MOU will generate only a small portion of these total potential savings from landscape conservation.

<u>Retrofit homes with more efficient washing machines</u>. Replacing 50 to 100 percent of the average washing machines in use in 1995 with currently available horizontal axis washing machines could generate 97,000 to 194,000 acre-feet.[17] Future savings could increase further as even more efficient models come on the market. Because a BMP for horizontal axis washing machines was only recently added to the MOU, these potential savings are not yet reflected CALFED's estimates of potential urban water conservation savings.

<u>Retrofit businesses and institutions with commercial Ultra Low Flow Toilets (ULFTs).</u> According to a 1997 study by the Urban Water Conservation Council, savings from commercial ULFT retrofits ranged from 16 to 57 gallons per day (gpd), with wholesale establishments saving 57 gpd, and food stores and restaurants saving approximately 48 gpd.[18] Statewide savings from retrofits could yield 200,000 acre-feet, assuming that 5 million retrofits occur with average savings of 35 gpd.

<u>Implement existing BMPs for residential indoor use at levels above MOU specifications.</u> A substantial additional increment of cost-effective conservation is achievable by implementing existing BMPs above the levels specified in the Urban Water Conservation MOU. For example, potential savings from 4 indoor residential measures alone (ULFTs,

[15] DWR Bulletin 160-93 notes that residential outdoor use ranges from 30 to 60% (p. 153) DWR Bulletin 166-4, *Urban Water Use in California*, notes that urban seasonal water use ranges from 26% to 58%. (p.24) Bulletin 166-4 notes that while some seasonal water use is not due to landscape use, this is offset by the fact that some landscape water use occurs year round. Therefore, seasonal use is a reasonable approximation for landscape use.
[16] Benefits to the Delta may be somewhat lower than that since some portion of applied landscape water may return to the system for future use.
[17] Gleick, et al., Appendix B.
[18] Hagler Bailly Services, Inc., *The CII ULFT Savings Study*, (San Francisco: 1997) Sponsored by the California Urban Water Conservation Council

showerheads, faucet aerators, and leak detection) could yield over 300,000 acre-feet.[19]

Implement existing BMPs for commercial, industrial and institutional water use at levels above MOU specifications. Additional savings are also possible from commercial, institutional, and industrial (CII) water conservation efforts above MOU specified levels. CII use represents almost 40% of urban water use, or almost 3.5 million acre feet. Recent studies estimate potential cost-effective savings of 20 to 30%,[20] which corresponds to statewide savings of 700,000 to 1 million acre feet. Full implementation of the CII BMP should capture 350,000 acre feet, leaving at least 350,000 to 650,000 of cost-effective savings available.

3. Water Acquisitions and Transfers

California already has an enormous developed water supply, much of which is currently used in a highly inefficient manner. In addition, California's rigid and inflexible system for allocating available supplies according to seniority exacerbates water management problems in the over-allocated Bay-Delta system. Thus, relatively small periodic "shortfalls" can, and do, fall disproportionately on particular users. In such a seniority-based system, where the marginal cost of developing "new" supplies is high and the marginal benefit of the least productive water uses is low, voluntary transfers between consumptive users offer potentially significant economic and water supply reliability benefits to individual water users and the state as a whole. They can also be used to address our over-allocation problem directly, and to provide a cost-effective and flexible suite of approaches for helping to secure and sustain improved ecosystem flows. Finally, transfers have the potential to provide significant near-term and dry year benefits, making them particularly appropriate for a major effort in CALFED's Stage 1.

Many other demand side strategies discussed in this section offer the potential for real water savings. However, water users will resist more stringent regulatory requirements to achieve these savings, and taxpayers are likely to resist a new generation of water development subsidies. Market-oriented transfers offer an important third path to encourage increasingly efficient use of our existing water supplies.

If transfers are conducted in an irresponsible manner, they have the potential to harm local communities and the environment, both in the Delta and in upstream regions. A variety of mechanisms can assure adequate protection for all legitimate interests and ensure that proposed transfers and acquisitions make sense as part of a more comprehensive and sustainable long-term water management framework. A full discussion of relevant assurance mechanisms is beyond the scope of this document, and will de addressed subsequently. However, measures which will be needed to facilitate the development of a more active market include:

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[19] Gleick et al., p.35.

[20] Gleick et al, p. 32, citing J. Sweeten and B. Chaput, (1997), "Identifying the Conservation Opportunities in the Commercial, Industrial, and Institutional Sector"; U.S. EPA, (1997) "Study of Potential Water Efficiency Improvements in Commercial Businesses".

- Comprehensive metering and/or equivalent measurement of "flows" of surface and groundwater into and out of the Bay-Delta system;

- A robust and comprehensive regulatory/operational surface water baseline sufficient to protect all affected public trust resources;

- A comprehensive set of basin-specific sustained yield groundwater management programs which fully protect groundwater and related aquatic and terrestrial ecosystems;

- A system for converting the above baseline and any permanently acquired ecosystem supplies into a system of permanent ecosystem rights, and for securing and tracking acquired "temporary" supplies;

- Secure and sufficient ecosystem funding;

- A proactive water transfers clearinghouse, including use of a statewide electronic bulletin board and other mechanisms;

- Strategies to facilitate meaningful community involvement;

- Water use and transfer mitigation surcharges to fund mitigation and retraining programs for members of affected local economies; and

- The adoption of measures to resolve disputes between water users, retailers and wholesalers (such as direct buy-back programs, thresholds for out-of-area transfers, or other means).

With these protections in place, an expanded market between consumptive users would allow "water short" agricultural and urban areas to purchase water from "water rich" agricultural areas, encouraging overall water use efficiency. Such a market could also induce source regions to more effectively and sustainably manage their groundwater basins for multiple benefits. But perhaps the greatest incentive to further development of a consumptive-use water transfer market would be the elimination of all subsidies for any "new" water development.

A primary objective of a more flexible, market-oriented approach to allocating available supplies should be to "re-acquire" developed water supplies to improve ecosystem protections. A voluntary, willing-seller environmental "re-acquisition" program would augment existing regulatory requirements (CVPIA, ESA and 1995 WQCP). It would also help match long-term restoration needs with variable geographic, biological and hydrological conditions by securing water rights and supplies to improve instream flows and Delta outflows.

Transfers and acquisitions should be implemented in ways which assure that there is no net increase in baseline diversions or consumption. In addition, CALFED's Stage 1 efforts should focus on facilitating increased "south-to-south" water transfer opportunities for consumptive use (including Colorado River region transfers) as well as Valley-wide ecosystem acquisitions. Subject to the above conditions, water transfers originating in upstream (above export) areas would be allowed, but limitations on through-Delta conveyance, necessary carriage water premiums, and the lesser amounts of developed water potentially available for transfer from above-export sources combine to suggest that "north to Golden Gate" acquisitions are a more cost-effective and likely result.

The primary mechanisms for acquiring environmental supplies and developing an active consumptive use water market include:

Direct acquisition of instream water rights: Water rights would be purchased from willing sellers and permanently transferred to environmental uses.

Re-operation of stored water: The purchase of stored water in existing hydropower reservoirs could be used to improve fishery flows and for riparian restoration and other ecosystem improvements.. Such purchases of stored water are not appropriate for consumptive uses, except as discussed below in Section III C 2(b) of this document.

Conservation-related investments: The water conserved through investments in improved conveyance efficiency, water saving irrigation technology, crop-mix changes, and other conservation-related investments should be shared between instream acquisitions and consumptive uses.

Voluntary land fallowing and land retirement: A huge water market could be created by transferring the consumptively used portion of water applied to some irrigated lands to the environment and other consumptive users. A mixture of drought options, short- and long-term leases, rotational fallowing, opportunistic ("spot") acquisitions, and permanent retirement, could result in millions of acre-feet of water savings per year in the Central Valley alone, as discussed above.

Groundwater transfers to instream/ecosystem use: Reducing surface water diversions during critical periods by relying on sustainable groundwater supplies could produce significant amounts of water for instream/ecosystem use.

Groundwater transfers to consumptive use: These transfers could become a significant source of consumptive use transfers over time, but should be strictly limited to previously banked groundwater supplies until shown to comply with a fully-protective, sustained-yield groundwater management plan.

The amount of water potentially available through the use of acquisitions and transfers is discussed elsewhere in this section (e.g. groundwater, voluntary fallowing and land retirement, and agricultural conservation).

4. Wastewater Reclamation and Recycling

By the year 2020, according to CALFED, over 3 million acre-feet of wastewater will be generated annually by urban coastal areas. CALFED estimates that under a "no action" scenario California will recycle approximately half of this and generate 1.17 million acre-feet of reusable water[21]. Implementation of the CALFED water recycling program could generate from zero up to an additional 550,000 acre-feet in new supply, for total of up to 1,720,000 acre-feet in recycled supply.

Recycled water may be among the more expensive soft path alternatives. However, it offers important secondary benefits, including water quality benefits, and deferred or avoided costs for new or expanded wastewater treatment plants. Water reclamation is also one of the least controversial supply reliability measures.

While CALFED has identified the potential for creating up to 1.7 million acre feet of recycled water, it has not adopted that figure as an objective. Indeed, CALFED recognizes that the amount of new recycled water to be generated as a result of the CALFED program may only be zero.

C. Supply-Related Strategies

The strategies discussed in this section address the supply side of the water management equation. The environmental community has expressed grave concern about some of these measures because of the potential for additional serious impacts on an already devastated ecosystem. However, as part of a balanced CALFED water supply reliability program which also assures environmental water supply reliability (see Section III below), we believe that the measures identified below may have merit.

1. Groundwater Banking and Conjunctive Use

It is broadly recognized by CALFED, and among most stakeholders, that making better use of California's substantial groundwater resources offers potentially significant and cost-effective near- and long-term water supply reliability benefits for all.

Crafting and implementing an ambitious array of well-regulated groundwater storage and conjunctive management programs designed to achieve this potential should be the "supply side" focus and priority of an integrated and cost-effective Stage 1 water supply

[21] Reclamation is the exception to the "no new water" rule discussed in the introduction, as it actually does create "new" water. CALFED defines "new" water generated by reclamation as that which would otherwise be lost to consumptive use. Currently, some "unreclaimed" waste water is returned to streams and reused by downstream users. (CALFED EIR/EIS Water Use Efficiency Water Use Efficiency Component p. 1.4)

reliability strategy. As discussed further in section III B 3, necessary protections and assurances will include comprehensive groundwater monitoring as well as basin-specific sustained-yield management. Developing the institutional and legal arrangements needed to protect recharged groundwater supplies for later withdrawal is a necessary condition to successful groundwater development that would also greatly increase the incentives for implementing such programs.

The potential for groundwater banking varies according to many factors, including (1) aquifer storage capacities, (2) the relationship between groundwater levels and ecosystem needs, (3) the use of groundwater pumping to support local economic activities, (4) the source of water to be banked, and (5) the ability to convey water both to and from a particular recharge site.

Such programs will require the development of local conveyance systems, active recharge sites, extraction wells, and other local infrastructure. Nevertheless, they can be implemented in ways that provide enhanced reliability benefits for all sectors without adding pressure to an already-oversubscribed Bay-Delta system if (1) they are based on a truly comprehensive management regime, and (2) are structured to look beyond so-called "surplus" water – water which may be available for diversion or export after an improved ecosystem baseline is firmly in place – to include a diversity of alternative sources (transferred and acquired supplies, "self-savings" derived from baseline allocations, drawdowns of existing reservoir supplies, etc.).

A reservoir drawdown program illustrates the potential. In many years, a portion of the water scheduled to be carried over in existing surface reservoirs could be released and stored in aquifers through percolation or injection, or supplied directly to users otherwise dependent on groundwater (so called "in lieu" recharge). During the ensuing rainy season, these reservoirs would be able to capture additional surface runoff, thereby replacing the water previously released for storage in a groundwater bank. (In the event that "refill" did not occur, previously banked supplies and/or previously-agreed upon risk-compensation payments could be used to help to make ends meet.) While this approach is not without potential complications, studies indicate that it could result in as much as 1 million acre-feet of additional "yield" becoming available, even after factoring in the need to meet instream flow, temperature criteria, and other environmental and water management constraints.[22]

Other studies demonstrate that these and related programs are both cost effective and dramatic in their potential to address California's water management needs. For example, the CVPIA Least Cost Yield Plan estimates that active groundwater recharge programs could produce approximately 940,000 acre feet of yield per year, with costs ranging from as little as $60-$120 per acre foot. While these costs can be expected to increase as "market-based" or "self saving" source-water elements are included, they continue to show great promise in comparison other supply-oriented alternatives.

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[22] NHI, 1998. An Environmentally Optimal Solution: A Response to the CALFED Bay Delta Program.

2. Changing the Operation of Existing Reservoirs.

Throughout California, more than 4,000 existing dams and reservoirs involving more than 60 million acre feet of combined storage capacity are operated according to rules and criteria that have developed in piecemeal fashion over the course of many decades. As the preceding section suggests, relatively modest changes in operations that are coordinated and integrated with other CALFED options can do much to improve water supply reliability for all beneficial uses. Before rushing to build costly new dams and reservoirs, a comprehensive re-assessment of integrated re-operation opportunities is needed in at least the following areas:

(a) Floodway Restoration and Changes in Flood Reservation: Operators of most major Central Valley reservoirs currently set aside reservoir capacity to capture flood flows in order to protect downstream property and lives. This flood reservation, in effect, reduces potential annual carryover storage of water supplies by requiring that a certain amount of reservoir space be kept empty.

Total downstream flood protection is the sum of vacated storage behind the dam and the amount of water than can be released in any given period of high runoff. Annual carryover storage -- and thus water supply reliability -- could be significantly increased if dam operators were allowed, in appropriate circumstances, to decrease the total flood reservation space behind the dam. There are three basic, and often necessarily integrated, approaches to responsibly increasing water storage and subsequent yield, without compromising important flood control functions:

- Develop more sophisticated reservoir rule curves that incorporate forecast-based release operations and integrated reservoir operations. Such operations would allow both conditional encroachment of existing flood control reservations as well as encourage larger temporary reservations as meteorological conditions dictate.

- Increase dam outlet capacity where outlet constraints limit effective use of downstream floodways and reservoir flood control reservations.

- Increase floodway capacity and the ability to safely inundate floodplains if floodways prove insufficient to handle foreseeable flood flows.

In this context, floodway and floodplain capacity restoration would include: wider floodways; purchase of land or easements on lands that would flood by design; increased protection where needed, such as localized ring levees, for sensitive infrastructure or communities; and other options for getting, and/or keeping, people "out of harm's way."

Increasing the frequency and size of moderate flood events, concurrently with other actions to restore floodways is already a central part of the CALFED ecosystem restoration program. In addition to facilitating the attainment of ecosystem objectives, this approach would provide the added water supply reliability benefit of augmenting storage in existing reservoirs. It is important to note that this approach would not affect the size or frequency of large floods, as it would not reduce the total flood reservation.

CALFED should evaluate the potential for increasing annual carryover storage by increasing allowable controlled releases from Central Valley dams as floodways are restored, thereby reducing the amount of reservation necessary behind each dam. For example, analysis of operations at Friant Dam indicate that alterations in the flood reservation regime could increase carryover storage on the San Joaquin River by approximately 5 to 10 percent.[23] Assuming that altering the flood reservation regime at other major terminal reservoirs could increase storage by 2-3 percent, this measure could increase annual storage in the Central Valley by a minimum of 400,000 to 600,000 acre feet. The actual increase in the amount of water captured and stored from this operational change can only be estimated through additional site-specific modeling analyses. However, a comparable small percentage increase in available carryover storage at most major reservoirs has the potential to significantly improve water supply reliability Valley-wide, particularly in dry years following wet years.

(b) Reoperating Hydropower Reservoirs: The non-consumptive water storage rights in existing hydropower reservoirs (up to 3.2 million acre-feet of combined capacity) can potentially be purchased and utilized for a variety of reliability purposes. For example, a portion of the flood-reservation burden discussed above could be transferred to acquired hydropower storage capacity. Upstream hydro-storage capacity could also be used to re-regulate acquired instream supplies, including acquired storage rights, ensuring that purchased flow improvements are available when and where needed. The purchase and transfer of non-consumptive storage rights to consumptive purposes may be appropriate for upstream (area of origin) communities if implemented in conjunction with environmentally restorative actions and if offset by equivalent reductions in exports of "surplus" water (i.e., water surplus to the needs of area of origin communities and ecosystem resources.) Given the scope and direction of the electric utility industry restructuring currently underway, a comprehensive evaluation of all such opportunities should be a critical focus of CALFED's Stage 1 efforts.

(c) Environmental Water Banking. It has been a long-standing practice in the federal CVP to "reschedule" allocated water from one year to the next. Such informal "banking" of unused allocations has never been available to ecosystem resources, even though it was affirmatively authorized "for drought protection and other purposes" in conjunction with the dedication of ecosystem supplies under the 1992 CVPIA (section 3408(d)). One need look no farther than across the Sierra Nevada crest to see how the Truckee River Operating Agreement is using reservoir banking and a market-based acquisition program to facilitate improvements for all involved. Developing and implementing similar programs throughout the Central Valley should be another focus of CALFED's Stage 1

[23] NHI, 1998. An Environmentally Optimal Alternative: A Response to the CALFED Bay Delta Program.

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efforts.

3. Restore Upper Watersheds

Watershed restoration to increase water infiltration and retention will increase surface and groundwater yields in dry seasons and years, particularly in undammed watersheds. Watershed restoration would provide the added benefits of improving ecosystem conditions and attenuating flood peaks. Loss of existing reservoir storage capacity from sedimentation due to erosion in the upper watersheds could also be stemmed through commitment to a significant and well-funded watershed restoration program. Although measurable water supply benefits from watershed restoration will take several years to accrue, they could prove to be particularly valuable in the event of prolonged drought or a shift in the rain to snow ratio resulting from predicted global warming. At this time, there is not enough information or analysis to calculate the magnitude of increased yields from watershed restoration, but the promise of this approach warrants more examination of this approach.

4. Changes in Delta Operations

We recognize that certain changes in Delta operations and construction of certain facilities could provide increased supplies for consumptive uses of water. However, such reoperations and facilities could also exacerbate ecosystem harm. We support the approach that is now being developed by the DEFT and "No Name" groups to integrate fully planning for water supply flexibility tools with increased environmental protections in the Delta. There appears to be reason for optimism that water supply reliability for consumptive uses can be increased while promoting ecosystem health.

CALFED's proposal to explore modifications that would provide greater operational flexibility including use of joint point of diversion, relaxation of COE criteria to allow increased SWP pumping capacity and construction of an intertie between the California Aqueduct and the Delta-Mendota Canal should be evaluated only within the framework of new criteria for biological protection. Otherwise, the use of these tools and facilities could potentially undermine CALFED's ecosystem restoration objectives and off-set biological benefits to fish species of concern (i.e., chinook salmon, steelhead trout, Delta smelt, and striped bass, and others). Assessment of these tools should not be limited to effects within the Delta, but should also include the expected effects of changes in reservoir operation on instream flows and riparian corridors.

In our view, implementation of the operational flexibility measures under consideration by CALFED should be bound by the following express conditions:

(a) All baseline regulatory requirements (the 1995 WQCP, the CVPIA and current ESA protections) are implemented in full;

(b) All additional biological protections proposed for Stage 1 by EWC (see below) and required for future compliance with state and federal environmental laws be implemented in full; and

(c) Assurances are in place guaranteeing that operational changes will conform with the criteria listed in 1 and 2 above and will enable the public to enforce these conditions.[24]

D. Flow-Related Ecosystem Needs

As discussed in Section 1, CALFED's water supply reliability program must do more than provide reliability for consumptive use -- it must also provide reliability for the environment. This reaches beyond mitigation for adverse impacts related to consumptive use of water and to the affirmative requirements of the ecosystem restoration program.

Restoring the Bay-Delta ecosystem, both upstream and in the Delta, will require water, as clearly indicated by the ERPP and DEFT discussions. That water must be provided by CALFED through its water supply reliability and other program elements. We believe the evidence demonstrates that CALFED can craft a program which provides significant water supply reliability benefits for both ecosystem restoration and urban and agricultural water users. Given the level of impacts from existing diversions, the long-term ecosystem needs are substantial. While it develops specific measures to meet these long-term needs, CALFED should begin by meeting the most urgent ecosystem needs during Stage 1 by implementing the actions outlined below.

1. Delta Flow-Related Improvements: Improvements in Delta operations are currently under discussion in the DEFT group. While these discussions continue to progress, our initial recommendation is that CALFED should implement the following biological protections in the Delta. These criteria represent ecosystem protection measures above and beyond the current level of protection provided by the 1995 WQCP, full implementation of the CVPIA and current ESA protections. Additional restrictions on exports during periods of significant biological concern are necessary given the status of many estuarine dependent species that are either listed or proposed for listing under the state or federal ESA's.

- April and May: Operations should be adjusted to provide increased Delta inflow from the San Joaquin River, and decreased exports, as specified in the VAMP study, during the entire months of April and May to provide increased protection of outmigrating San Joaquin chinook salmon and Delta smelt.

- November through January: Operations should be adjusted during the fall months to achieve a reduced export/inflow ratio (55% in November and 45% in December and

[24] For example, it may be necessary to establish a mechanism to bank a pre-determined amount of water (a portion of the yield of water supply tools such as joint point, groundwater storage, transfers and land retirement) to be called upon as necessary to reduce Delta exports and allow resource agencies to directly respond to biological problems at the export facilities.

January) to provide increased protection for spring run yearlings, and fall- and late-fall run fry emigrating through the Delta.

- February and March: Operations should be adjusted to provide increased Delta outflow in February and March, in dry years, to achieve X2 protection consistent with a 1962 level of development. This would provide an increase in protection for most estuarine and anadromous fish, particularly Delta smelt.

Potential impacts to Suisun Marsh from changes in Delta flow patterns have not been adequately evaluated or addressed. CALFED should develop and implement additional measures to protect and restore the biological diversity of Suisun Marsh.

2. Upstream Flow-Related Benefits: The ERPP, the AFRP and endangered species recovery plans all call for improved flow conditions in upstream areas, north and south of the Delta.. CALFED should continue to develop and implement these flow improvements during Stage 1, to provide improved habitat for species of concern and to achieve other CALFED ecosystem restoration goals.

3. Cap on Depletions and Diversions: We have elsewhere discussed the need for a state water budget. Establishing and implementing such a budget will require an adequate baseline, accurate measurement, a clear accounting methodology and, in our view, a cap on average annual diversions and depletions from the Bay-Delta system. Such a cap would offset capability to divert large amounts of water in wet years, with badly needed protections in dry years. This cap should be no higher than and, by the end of stage 1, should be lower than current levels.

SECTION IV: REVISED STAGE 1 ACTIONS FOR WATER SUPPLY RELIABILITY

Below are a limited set of preliminary recommendations intended to respond to the proposed Stage 1 recommendations in the August version of the draft "Developing a Preferred Alternative" document. As indicated below, some of these actions should be completed prior to Stage 1.

A. A Foundation for Water Supply Reliability

1. Prior to Stage I, CALFED should establish measurable objectives for each element of the water supply reliability program, including water conservation, recycling, and transfers.

2. Develop a water budget for the Bay-Delta system, including establishment of a registry of instream flows and more comprehensive measurement of withdrawals, depletions, diversions and exports for consumptive use.

3. Prior to Stage 1, develop realistic and accurate modeling assumptions regarding baseline water deliveries in the CALFED no action alternative.

4. Implement a surcharge on water use in the Bay-Delta system to fund the ecosystem restoration program.

5. Create a finance strategy to incorporate the full environmental and economic costs of water supply reliability strategies.

B. Demand Benefits

1. Measure all agricultural and urban water use.

2. Implement certification and enforcement program to ensure full implementation of the urban water conservation BMP's.

3. Capture conservation savings above full implementation of the Urban MOU. This should include implementation of the BMP's at a level that would capture all cost-effective savings, as well as implementation of cost-effective measures not yet included in the MOU.

4. Prior to Stage 1, develop performance standards for agricultural water use efficiency to measure progress towards program objectives, and an enforcement program comparable to the one proposed for urban water use.

5. Develop loan, grant and cost-sharing programs to increase local participation in urban and agricultural water conservation strategies.

6. Design and implement research programs/pilot programs to address remaining areas of uncertainty in water use efficiency. For example, conduct research on the relationship between evaporation and transpiration, and the potential for reducing irrecoverable losses through reductions in evaporation.

7. Prior to Stage 1, complete CALFED's economic marginal cost analysis of water management alternatives. Ensure that secondary benefits of "soft path" alternatives, including water quality, flood management, avoided drinking water and waste water treatment and capital costs, energy savings, etc. are fully reflected in this analysis.

8. Identify and then develop a program and plan to address legal and institutional barriers to water transfers, and improve use of existing infrastructure for transfers, as appropriate.

9. Develop and implement an appropriate set of assurances to provide protection to the environment and local economies from water transfers.

10. Encourage "south to south" transfers to meet consumptive use needs and "north-to-Golden Gate" and storage transfers to meet environmental needs.

11. Establish, fund and implement an environmental water acquisition program with at least an annual budget of $100 million to endow a drought year reserve fund and help meet long-term ecosystem restoration objectives. Performance measures to indicate successful implementation, in amounts of water, or the like, should be established prior to the initiation of Phase I and linked to other program elements.

12. Develop proposals for an institutionalized groundwater bank to facilitate transfers (see related recommendations below).

13. Develop best management practices for water recycling, including full evaluation of recycling opportunities, regional water recycling targets, and performance standards.

14. Develop loan, grant and cost-sharing programs to increase local participation in recycling strategies. Such programs should encourage regional efforts.

C. Supply Benefits

1. Develop an implementation framework for a comprehensive and properly regulated groundwater banking and conjunctive use program, including measurement of groundwater; designation of sustainable yield (maximum allowable while preserving aquifer capacity, ecological benefits and other values) for each groundwater basin; feasibility and cost studies; pilot projects; criteria for evaluation, permitting and operation of specific projects; statutory changes to address barriers to implementation; and construction of recharge, pumping and conveyance infrastructure. CALFED

should also develop loan, grant and cost-sharing programs to increase local participation in groundwater strategies.

2. Investigate and implement reservoir reoperation to utilize expanded floodways for all major reservoirs in the Central Valley.

3. Investigate and, as appropriate, implement the Delta reoperation strategies identified in Section III C, subject to the express environmental conditions set forth in Section III C and D. Develop appropriate assurance mechanisms.

4. Complete least cost and equivalency analyses, and develop willingness to pay formulas for potential new or expanded surface storage facilities. Require water users to pay the full planning costs for any such studies.

D. Flow Related Ecosystem Benefits

1. Implement the Delta flow improvement measures discussed in Section III D.

2. Develop and implement flow-related improvements for Suisun Marsh, upstream, riparian and floodplain restoration.

3. Develop and implement an environmental water banking program in groundwater and existing surface storage facilities, as authorized by the CVPIA.

4. Establish a cap on average annual withdrawals, depletions and diversions from the Bay Delta system which is no higher than current levels.

APPENDIX 1: PRELIMINARY MODELING RESULTS OF POTENTIAL CHANGES IN DELTA OPERATIONS

This appendix compares preliminary modeling projections of both export availability and ecosystem protection under our recommended Delta operating criteria to other management scenarios. These scenarios include:

1. Actual operations since 1975 (using information from the Dayflow database).

2. Projected operations complying with ESA requirements, the 1995 Water Quality Control Plan, and Interior's interim criteria for implementation of the CVPIA (DWR's DWRSIM study 549new).

3. Projected operations complying with the protective criteria described in Section 3 in addition to those described under (2) above (EWC DWRSIM study EBSSN-5).

4. Projected operations complying with the protective criteria described in Section 3 and including use of the joint point of diversion, the Interim South Delta Plan, and an intertie between the Delta Mendota and California aqueducts (EWC DWRSIM study EBSSN-6).

Table A1-1 compares total Delta exports under these scenarios for three periods, (1) the recent dry period from June 1986 until September 1992, (2) recent water years 1975-1994, and (3) the historic hydrology from 1922 until 1994. For the exports projected under studies EBSSN-5 and EBSSN-6, no assumption is made as to how this water is distributed after leaving the Delta for any of its possible uses, including delivery to export project urban and agricultural contractors, wildlife refuges or water bank to be used for environmental purposes. Figure A1-1 summarizes average Delta exports by month under each of the modeling studies.

Table A1-1 shows that, under the water management criteria recommended by EWC for implementation by CALFED in stage 1, average annual Delta exports are projected to be 395,000 acre-feet higher than those which actually took place under the recent historical hydrologic conditions from 1975 to 1994. It is not possible to compare actual to projected exports for the entire historic hydrology, since the Delta exports projects were not developed until the 1950s and 1960s. During a repeat of the very dry conditions between 1986 and 1992, which led to the most recent sharp decline in fisheries, however, average Delta exports under the EWC criteria are projected to be 774,000 acre-feet less than what actually occurred.

Preliminary modeling results suggest that the additional flows in the San Joaquin River can be achieved by allowing water to flow through tributary reservoirs during the April-May period. The average total flow increase of 52 TAF in April and May is offset, through reservoir reoperation, by a flow reduction of 49 TAF in other months. As a result of this reoperation, very little, if any, reduction in consumptive use would be required.

Figure A1-2 shows the projected average Delta inflow from the San Joaquin River during the April-May outmigration period for fall run salmon under each of the studies outlined above and compares these values to unimpaired flow estimates. Figure A1-3 shows the projected end-of-year storages for San Joaquin tributary reservoirs under each scenario. It is assumed that no releases from Friant Dam are made for fishery objectives.

Figure A1-4 shows how total exports would change under each of the modeling scenarios in December. In study EBSSN-5, exports would be curtailed in many years to protect winter-run and spring-run salmon. Study EBSSN-6 would also restrict December exports to protect these species, but would allow higher rates of export under wet conditions. Figure A1-5 shows the export inflow ratio for each of these scenarios in December.

Figures A1-6 and A1-7 show the projections under each scenario for total exports and the export-inflow ration in September, where scenarios EBSSN-5 and EBSSN-6 would allow a higher export-inflow ratio.

Figures A1-8 and A1-9 show the spring X2 position, in Critical and Dry years respectively, under each of the scenarios. The improvements in February and March in Dry and Critical years are due to the specific criteria recommended above. The improvements in April and May are due to the incremental protection provided by the extended export restriction during the April-May pulse period.

Table A1-1
Delta Export Comparison
(all values in TAF)

	Actual Historic Delta Exports	Study 549new		Study EBSSN-5		Study EBSSN-6	
Period	Average Exports	Average Exports	Difference from Actual	Average Exports	Difference from Actual	Average Exports	Difference from Actual
June 1986 - September 1992	4979	4328	651	4205	774	4342	636
October 1975 - September 1994	4596	5297	-700	4992	-395	5123	-527
October 1921 - September 1994	NA	5774	----	5402	----	5524	----

Figure A1-1
Delta Export Comparison
average of all years (1922-1994)

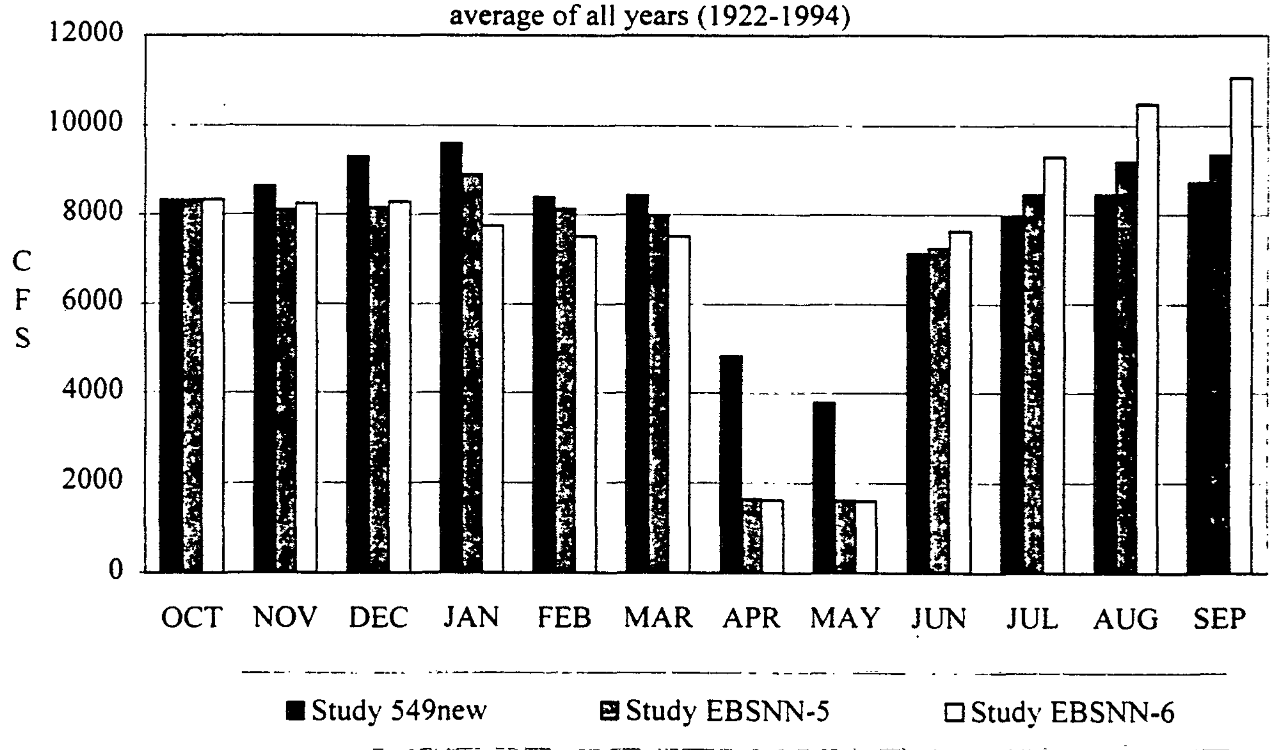

Figure A1-2
San Joaquin River at Vernalis
April-May Average Flow by Year Type

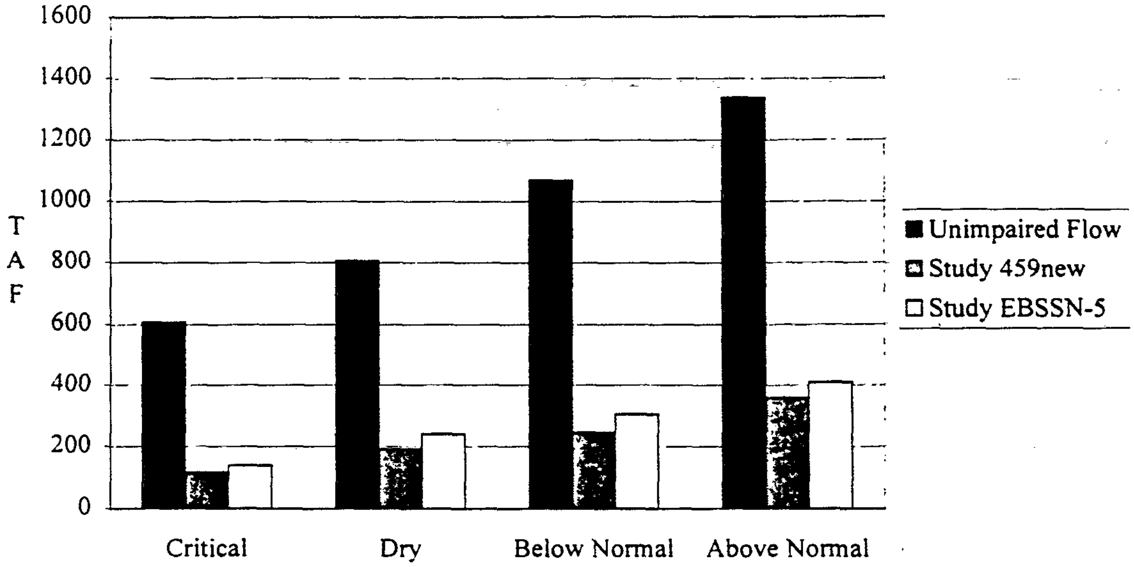

Figure A1-3
San Joaquin Tributary Reservoirs
Projected Carryover Storage

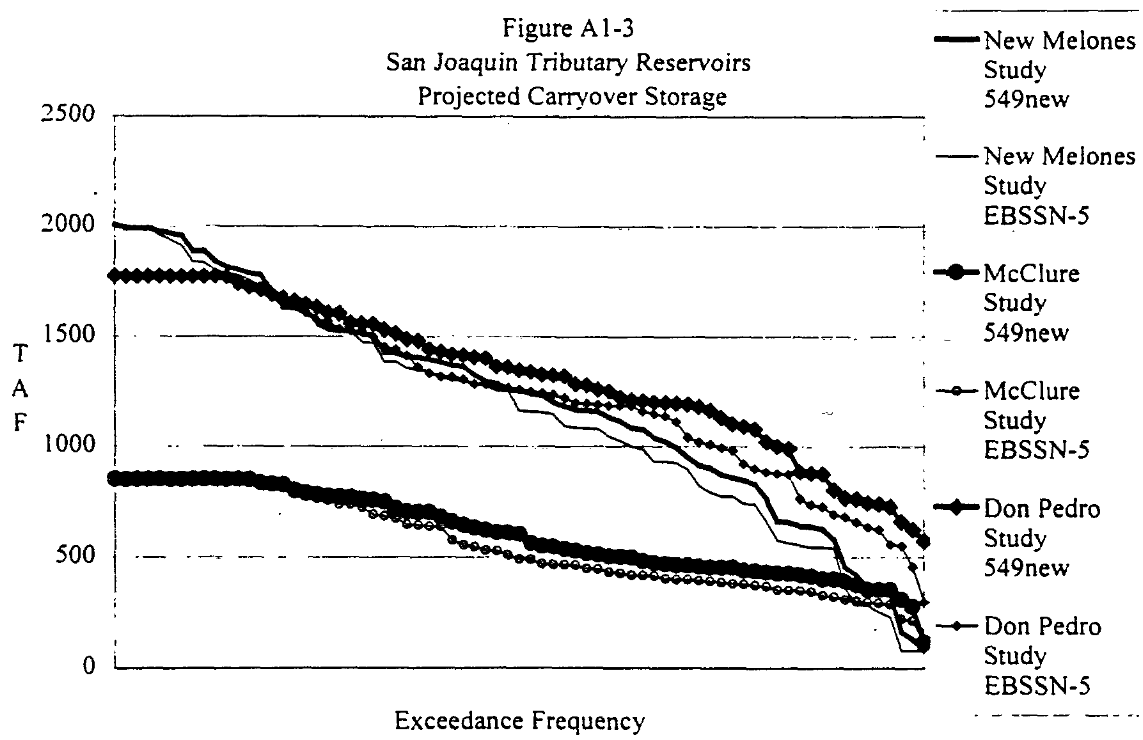

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Figure A1-4
December Delta Exports

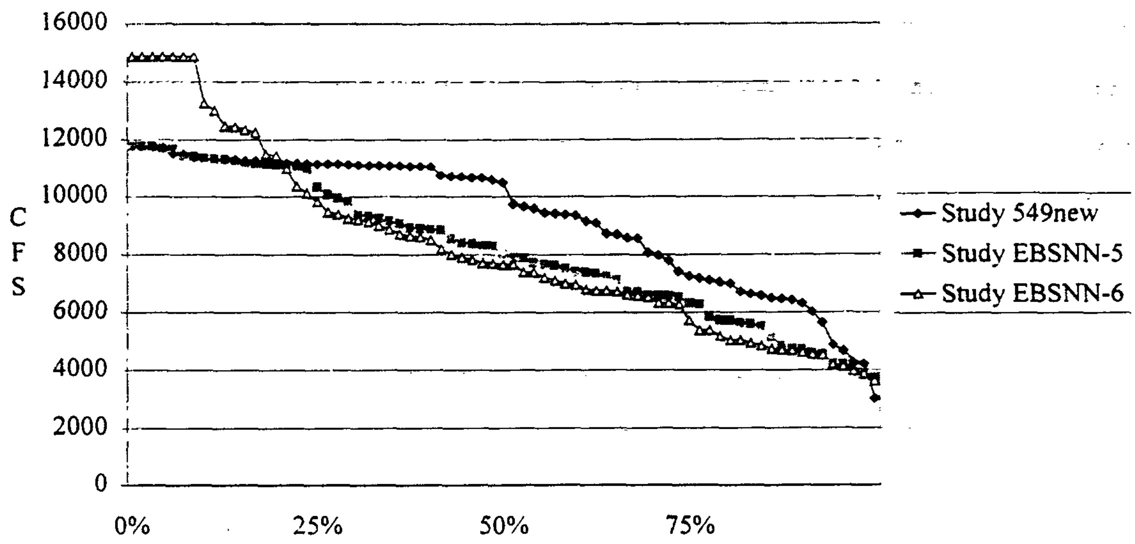

Figure A1-5
December Export-Inflow Ratio

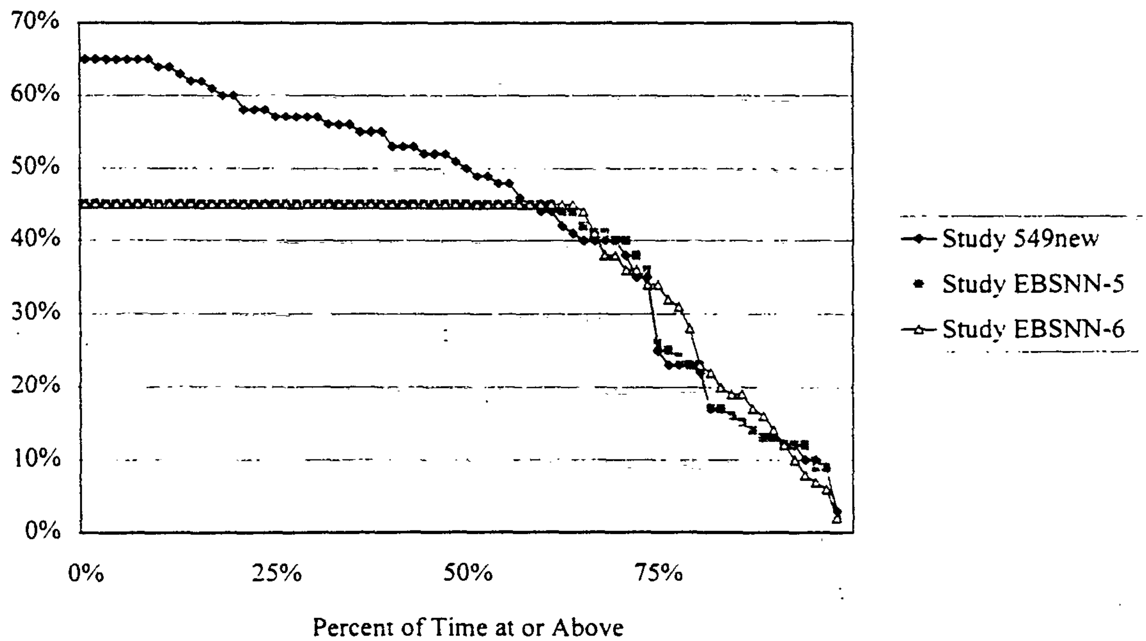

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Figure A1-6
September Delta Exports

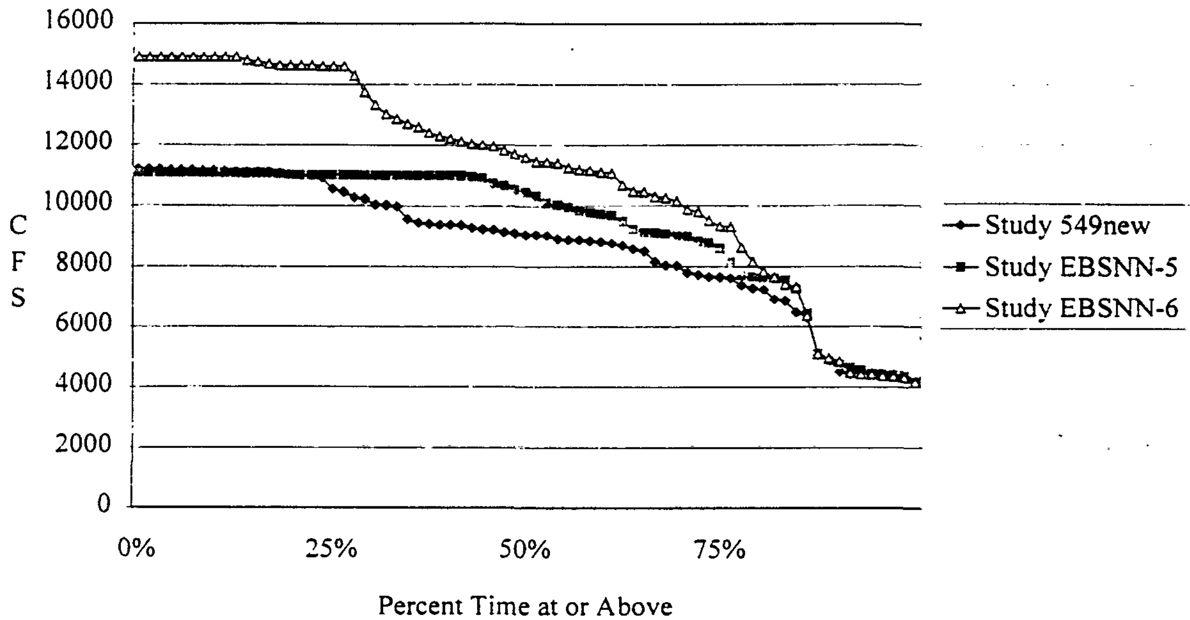

Figure A1-7
September Export-Inflow Ratio

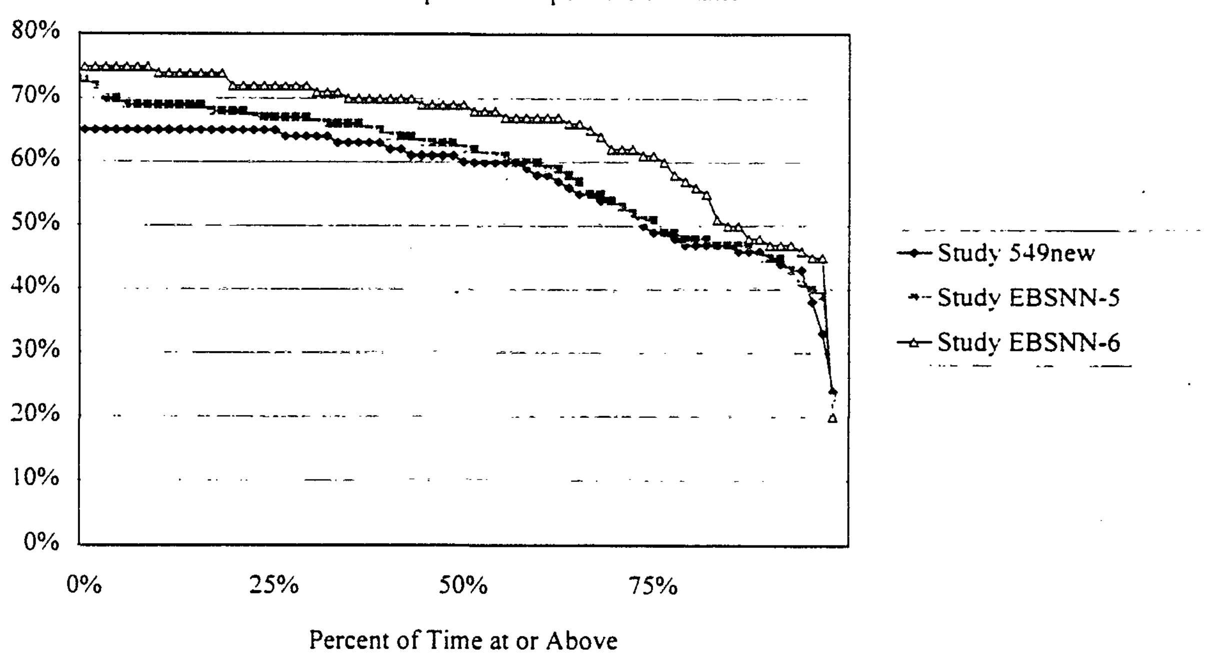

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Figure A1-8
Critical Year Average X2 Position

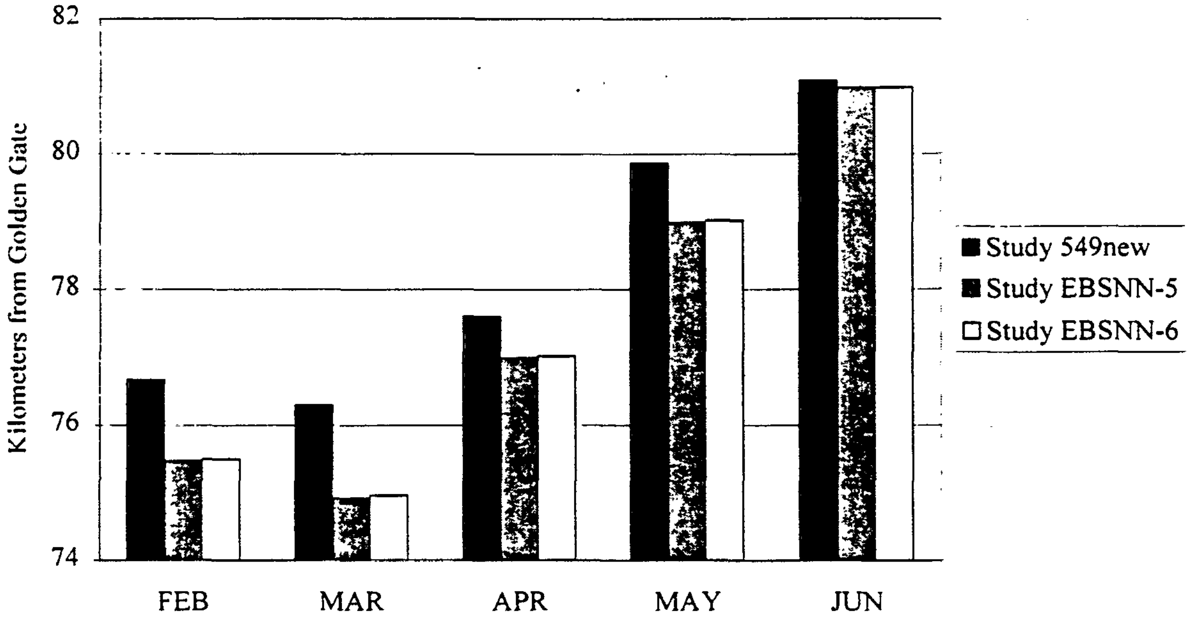
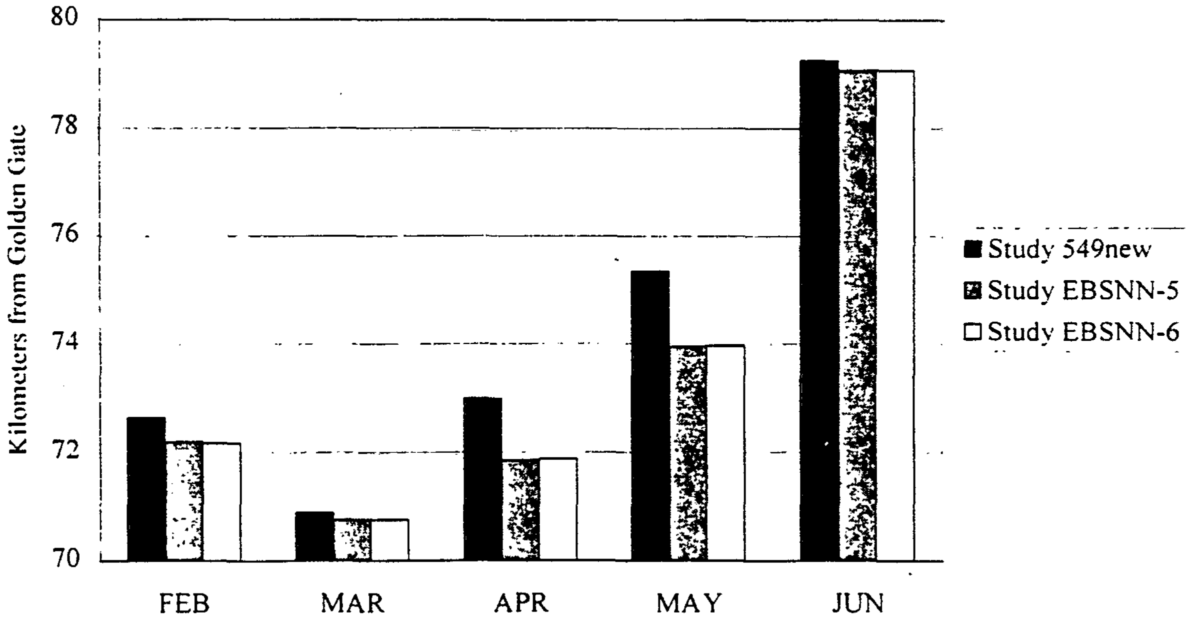


Figure A1-9
Dry Year Average X2 Position



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